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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/961,248	09/25/2001	Hidetaka Hattori	214391US2S	7284

22850 7590 02/19/2002

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EXAMINER

FARAHANI, DANA

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 02/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/961,248

Applicant(s)

HATTORI, HIDETAKA

Examiner

Dana Farahani

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 September 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Okabe et al., hereinafter Okabe (U.S. 5,973,338).

Okabe discloses in figure 6, a semiconductor device comprising a base layer 67 of a first conductivity type; a base layer 65 of a second conductivity type selectively formed on one surface of the base layer of the first conductivity type; one of an emitter layer and source layer 66 of the first conductivity type selectively formed on the surface of the base layer of the second conductivity type; one of a collector layer and drain layer 64 selectively formed on one of the one surface and a the other surface of the base layer of the first conductivity type; a first main electrode 62 formed on the one of the collector layer and drain layer; a second main electrode S formed on the one of the emitter layer and source layer of the first conductivity type and on the base layer of the second conductivity type; and a gate electrode G formed above part of the base layer of the second conductivity type which lies between the one of the emitter layer and source layer of the first conductivity type and the base layer of the first conductivity type with first and second gate insulating films, above and below layer 63, respectively, disposed there between; wherein the capacitance of a capacitor formed of the second gate

insulating film above layer 63 is different from that of a capacitor formed of the first gate insulating film below layer 63.

Regarding claim 2, the first gate insulating film above layer 63 is formed in a portion near the one of the emitter layer and source layer 66 of the first conductivity type and the second gate insulating film below layer 63 is formed in a portion near the base layer of the first conductivity type.

Regarding claim 3, the thickness of the second gate insulating film is larger than that of the first gate insulating film.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe, as applied to claims 1-3 above, and further in view of Kapoor (U.S. 6,300,663).

Okabe does not disclose the dielectric constants of the gate insulating films are different. Kapoor discloses gate insulating films where the dielectric constant of the first insulating film is higher than the dielectric constant of the second insulating film (see column 4, claim 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use gate insulator layers of different dielectric

constants so the layers would have different capacitances, thus less area on the semiconductor chip.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe as applied to claim 2 above. Okabe does not disclose an inclination on the side of the one of the emitter layer and source layer of the first conductivity type is smaller than that on the side of the base layer of the first conductivity type. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the inclination on the side of the source layer smaller so it would have larger capacitance, thus less area on the semiconductor chip.

6. Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe, and Okabe in view of Kapoor, as applied to claims 1-3 and 4 above, respectively, and further in view of Takahashi et al., hereinafter Takahashi (U.S. 6,331,466).

Okabe does not disclose the semiconductor device wherein the gate electrode is buried in a trench with the first and second gate insulating films disposed there between to form a trench structure. Takahashi discloses in figure 1, a gate electrode 210 is buried in a trench 207, which range from the surface to the layer beneath the top layer; and insulating film 209. Furthermore Takahashi discloses such a structure enhances the integration degree (see column 1, lines 35-40). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use gate trenches because of its easy miniaturization.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (703)305-1914. The examiner can normally be reached on M-F 8:00AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703)306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Dana Farahani
February 7, 2002


OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800